From the circumstances—
(a) That in the reduction processes in practice only materials are able to be used which, in addition to iron oxide and pure carbon, always contain silicic acid, phosphoric acid, manganese oxide, and sulphur compounds ;
(&) That carbon, in addition to iron oxide, also reduces all remaining oxides ;
(c) That, lastly, carbon and also sulphur and oxygen are soluble in iron and are taken up by it; it shows the impossibility of winning iron in its pure state from iron ores and carbon in technical working. The metal, on the contrary, always contains carbon, manganese, silicon, phosphorus, sulphur, and oxygen. All these substances, however, influence the properties of the metal considerably, and, indeed, each in different ways.
Now, oxygen and sulphur act always quite harmfully, and one is, therefore, constrained to reduce their amount to the smallest possible extent. Each of the remaining substances bestows on the iron in practice valuable properties, which generally make it only useful for specified purposes. By means of varying the relative proportions of the individual impurities one is able to produce the most manifold qualities of iron, which in their properties frequently exhibit greater variations than the different elements themselves. Each special property is, however, settled by quite definite proportions of the substances, and if these cannot be contained in the metal produced from the ore, it must undergo further treatment, which renders it possible to regulate the relative amounts of the impurities, be it by the removal of an excess of or by the addition of the deficient amounts of the individual substances.
In the process for the regulation of the composition of the metallic iron, the refinement processes, both methods are employed, but the removal process predominates. It never achieves it completely, for even the softest irons always still contain small quantities of carbon; generally also of manganese and phosphorus.
Most methods of manufacture of iron have the peculiarity that, in addition to carbon, other substances also, such as silicon, manganese, phosphorus and aluminium are used in